Amendments to the Claims:

The following listing of claims will replace all prior versions, and listings, of claims in the application:

1. (Currently Amended) A method for estimating a displacement of a second image acquired by a sensing device relative to a first image acquired by the sensing device, the method comprising:

determining a set of image-dependent correlation function value points indicative of a correlation function extremum, each image-dependent correlation function value point based at least partially on a pattern of image values included in both the first image and the second image, each image-dependent correlation function value point further based on a respective known spatial translation of the image values in the second image relative to the image values in the first image; and

estimating at least one respective spatial translation position corresponding to at least one respective symmetry point ~~which is not the correlation function extremum,~~ based on a plurality of the image-dependent correlation function value points bounding the correlation function extremum, the at least one respective spatial translation position ~~corresponding to the at least one symmetry point~~ indicative of the displacement of the second image relative to the first image,

wherein estimating the spatial translation position corresponding to the at least one respective symmetry point comprises determining the midpoint of at least one line segment having a first endpoint that is one of

a) an image-dependent correlation function value point, and

b) an estimated correlation function value point lying on the correlation function on a first side of the correlation function extremum, and a second endpoint that is one of

a) an image-dependent function value point, and

b) an estimated correlation function value point lying on the correlation function on the second side of the correlation function extremum.

2. (Original) The method of claim 1, wherein the plurality of correlation function value points bounding the correlation function extremum excludes at least one correlation function value point which lies at a spatial offset bounded by other members of the plurality of correlation function value points.

3. (Original) The method of claim 2, wherein the excluded at least one correlation function value point comprises the correlation function value point which is nearest to the correlation function extremum.

4. (Original) The method of claim 2, wherein the excluded at least one correlation function value point comprises each correlation function value point which is within a prescribed range of spatial offsets from the correlation function extremum.

5. (Original) The method of claim 2, wherein the excluded at least one correlation function value point comprises each correlation function value point which is within a prescribed range of correlation function values.

6. (Currently Amended) The method of claim 1, wherein determining the image-dependent correlation function value points comprises determining a difference between paired image values, the paired image values comprising an image value included in the first image and a corresponding image value included in the second image, and summing absolute values of the differences between the paired image values for a set of paired image values.

7. (Original) The method of claim 1, wherein estimating the spatial translation position corresponding to the at least one symmetry point comprises:

estimating a first estimate of the spatial translation position corresponding to the at least one symmetry point including predictable systematic estimation errors related to ~~the~~ asymmetry of the correlation function value points; and

adjusting the first estimate of the spatial translation position corresponding to the at least one symmetry point, based at least partially on the predictable systematic estimation errors, to at least partially reject predictable systematic estimation errors related to the asymmetry of the correlation function value points about the correlation function extremum.

8. (Cancelled)

9. (Currently Amended) The method of claim ~~8~~ 1, wherein ~~at least~~ one endpoint of the at least one line segment comprises an image-dependent correlation function value point, and the other end point comprises an estimated correlation function value point.

10. (Currently Amended) The method of claim ~~9~~ 1, wherein each endpoint comprises an image-dependent correlation function value point, the at least one line segment comprises first and second line segments, and estimating the spatial translation position corresponding to the at least one respective symmetry point further comprises:

determining a line containing the midpoint of the ~~at least one~~ first and second line segments, the line having a slope corresponding to the slope between the first end point

of the ~~at least one~~ first line segment and an adjacent ~~correlation function value~~ end point of the second line segment lying on the same side of the correlation extremum; and

determining a point on the line which has a y-coordinate value equal to the correlation function value of the second end point of ~~the~~ at least one of the first and second line segments, wherein that point is taken as the respective symmetry point.

11. (Currently Amended) The method of claim 1, wherein estimating the spatial translation position corresponding to the at least one respective symmetry point comprises:

determining a first spatial translation position of a first point ~~presumably~~ that is an image-dependent correlation function value point lying on the correlation function on a first side of the correlation function extremum; and

determining a second spatial translation position ~~which corresponds to the spatial translation position~~ of a second point ~~presumably~~ that is an estimated correlation function value point lying on the correlation function on the second side of the correlation function extremum, at a correlation value equal to the correlation value of the first point; and

determining the spatial translation position value which is midway between the first spatial translation position and the second spatial translation position.

12. (Cancelled)

13. (Cancelled)

14. (Currently Amended) The method of claim ~~13~~ 11, wherein the estimated correlation function value point comprises a point lying on an estimated line segment which is estimated to correspond to the correlation function in the vicinity of the line segment.

15. (Cancelled)

16. (Cancelled)

17. (Currently Amended) The method of claim ~~16~~ 14, wherein the ~~prescribed form~~ estimated line segment corresponds to a line of constant curvature.

18. (Currently Amended) The method of claim 17, wherein the ~~prescribed form~~ estimated line segment corresponds to a straight line.

19. (Cancelled)

20. (Cancelled)

21. (Cancelled)

22. (Currently Amended) A method for estimating a displacement of a second image acquired by a sensing device relative to a first image acquired by the sensing device, the method comprising:

determining a set of image-dependent correlation function value points indicative of a correlation function extremum, each image-dependent correlation function value point based at least partially on a pattern of image values included in both the first image and the second image, each image-dependent correlation function value point further based on a respective known spatial translation of the image values in the second image relative to the image values in the first image; and

estimating at least one respective spatial translation position corresponding to at least one respective symmetry point based on a plurality of the image-dependent correlation function value points bounding the correlation function extremum, the at least one respective spatial translation position ~~representing~~ indicative of the displacement of the second image relative to the first image;

wherein estimating the spatial translation position ~~does not depend on characterizing~~ corresponding to the at least one respective symmetry point comprises:

determining a first line including two image-dependent correlation function ~~in~~ value points lying on the ~~vicinity~~ correlation function on a first side of the correlation function extremum,

determining a second line having a slope that is the negative of the slope of the first line and that includes an image-dependent correlation function value point lying on the correlation function on a second side of the correlation function extremum and having a correlation function value in a range included within a range whose end points are the correlation function values of the two image-dependent correlation function value points included in the first line, and

determining the spatial translation position corresponding to the intersection of the first and second lines.

23. (Original) The method of claim 22, wherein the plurality of correlation function value points bounding the correlation function extremum excludes at least one correlation function value point which lies at a spatial translation position bounded by other members of the plurality of correlation function value points.

24. (Cancelled)

25. (Cancelled)

26. (Cancelled)

27. (Cancelled)

28. (Cancelled)

29. (Cancelled)

30. (Original) The method of claim 22, wherein estimating the spatial translation position comprises:

estimating a first estimate of the spatial translation position including predictable systematic estimation errors related to ~~the~~ asymmetry of the correlation function value points about the correlation function extremum; and

adjusting the first estimate of the spatial translation position, based at least partially on the predictable systematic estimation errors, to at least partially reject predictable systematic estimation errors related to the asymmetry of the correlation function value points about the correlation function extremum.

31. (Cancelled)

32. (Original) The method of claim 22, wherein the first and second images comprise a speckle pattern.

33. (Currently Amended) An image-correlation optical position transducer readhead, usable to measure displacement relative to a member having an image-determining surface, the readhead comprising:

a sensing device that receives light reflected from the image-determining surface, the sensing device comprising a plurality of image elements that are sensitive to the reflected light, the plurality of image elements being spaced apart along at least a first direction, the image elements spaced along the first direction at a predetermined spacing, the predetermined spacing usable to determine the spatial translation of an image on the readhead, the spatial translation of the image on the readhead usable to determine the relative displacement of the readhead and the image-determining surface along a predetermined direction,

a light detector interface circuit connected to the sensing device, the light detector interface circuitry outputting signal values from the image elements of the sensing device, the signal values representative of image intensities of the reflected light on those image elements, and

a signal generating and processing circuitry element connected to the light detector interface circuit;

_____wherein:

_____the light reflected from the image-determining surface creates an intensity pattern on the plurality of image elements based on the relative position of the image-determining surface and the readhead;

the light detector interface circuitry outputs a signal value from at least some of the plurality of image elements, the signal values together comprising an image;

the signal generating and processing circuitry element inputs a first image corresponding to a first relative position of the image-determining surface and the readhead and stores a representation of the image;

the signal generating and processing circuitry element inputs a second image corresponding to a second relative position of the image-determining surface and the readhead;

the signal generating and processing circuitry element, based on the first and second images, determines a set of image-dependent correlation function value points indicative of a correlation function extremum; and

the signal generating and processing circuitry element estimates a spatial translation position based on a plurality of image-dependent correlation function value points bounding the correlation function extremum, the spatial translation position representing the displacement of the second image relative to the first image;

wherein at least the image-dependent correlation function value point closest to the extremum is excluded from the plurality of image-dependent correlation function value points bounding the correlation function extremum, such that when estimating the spatial translation position ~~does not depend on characterizing~~ is not based on the image-dependent correlation function ~~in the vicinity of~~ value point closest to the ~~correlation function~~ extremum.

34. (Original) The readhead of claim 33, wherein the signal generating and processing circuitry element determines a relative displacement between the image-determining surface and the read head along at least one axis, based on the spatial translation position.

35. (Original) The readhead of claim 33, wherein the image-correlation optical position transducer readhead is a speckle-image correlation optical position transducer readhead, the image-determining surface is an optically diffusing surface, and the light reflected from the image-determining surface is generated from a coherent light source.

36. (Cancelled)

37. (Cancelled)

38. (Cancelled)

39. (Cancelled)

40. (Cancelled)

41. (Original) A speckle-image-correlation optical position transducer readhead, usable to measure displacement relative to a member having an optically diffusing surface, the readhead comprising:

a sensing device that receives the light scattered from a portion of the optically diffusing surface illuminated with coherent light, the sensing device comprising a plurality of image elements that are sensitive to the scattered light, the plurality of image elements being spaced apart along at least a first direction at a predetermined pitch,

a light detector interface circuit connected to the sensing device, the light detector interface circuitry outputting signal values from the image elements of the sensing device, the signal values representative of image intensities of the scattered light on those image elements, and

a signal generating and processing circuitry element connected to the light detector interface circuit;

wherein:

the light detector interface circuitry outputs a signal value from at least some of the plurality of image elements, the signal values together comprising an image;

the signal generating and processing circuitry element inputs a first image corresponding to a first relative position of the optically diffusing surface and the readhead and stores a representation of the image;

the signal generating and processing circuitry element inputs a second image corresponding to a second relative position of the optically diffusing surface and the readhead;

the signal generating and processing circuitry element, based on the first and second images, estimates a first plurality of correlation function value points indicative of a correlation function extremum;

the signal generating and processing circuitry element, based on a set of correlation function value comprising at least some of the plurality of correlation function value points, estimates a spatial translation position representing the displacement of the second image relative to the first image; and

wherein, for the speckle-image-correlation optical position transducer readhead, the ratio of the peak-to-peak systematic error which repeats at a period corresponding to one image element pitch to the number of correlation function value points in the set used to determine the spatial translation position is not more than about .02 parts of

the image element pitch per correlation function value point, when the peak-to-peak systematic error is expressed as a fraction of the image element pitch.

42. (Original) The speckle-image-correlation optical position transducer readhead of claim 41, wherein the ratio is not more than about .01 parts of the image element pitch per correlation function value point.

43. (Original) The speckle-image-correlation optical position transducer readhead of claim 41, wherein the ratio is not more than about .005 parts of the image element pitch per correlation function value point.

44. (Currently Amended) An image-correlation optical position determining system, usable to estimate a displacement of a second image acquired by a sensing device relative to a first image acquired by the sensing device, the system comprising a signal generating and processing circuitry element that:

determines a set of image-dependent correlation function value points indicative of a correlation function extremum, each image-dependent correlation function value point based at least partially on a pattern of image values included in both the first image and the second image, each image-dependent correlation function value point further based on a respective known spatial translation of the image values in the second image relative to the image values in the first image; and

estimates at least one respective spatial translation position corresponding to at least one respective symmetry point ~~which is not the correlation function extremum,~~ based on a plurality of the image-dependent correlation function value points bounding the correlation function extremum, the at least one respective spatial translation position ~~corresponding to the at least one symmetry point~~ indicative of the displacement of the second image relative to the first image,

wherein the estimates the spatial translation position corresponding to the at least one respective symmetry point comprises determining the midpoint of at least one line segment having a first endpoint that is one of

a) an image-dependent correlation function value point, and

b) an estimated correlation function value point lying on the correlation function on a first side of the correlation function extremum, and a second endpoint that is one of

a) an image-dependent function value point, and

b) an estimated correlation function value point lying on the correlation function on the second side of the correlation function extremum.

45. (Currently Amended) The image-correlation optical position determining device according to claim 44, wherein the first and second images acquired by the sensing device comprise speckle ~~images.~~ images.

46. (Currently Amended) An image-correlation optical position determining device, usable to estimate a displacement of a second image acquired by a sensing device relative to a first image acquired by the sensing device, the device comprising:

means for determining a set of image-dependent correlation function value points indicative of a correlation function extremum, each image-dependent correlation function value point based at least partially on a pattern of image values included in both the first image and the second image, each image-dependent correlation function value point further based on a respective known spatial translation of the image values in the second image relative to the image values in the first image; and

means for estimating at least one respective spatial translation position corresponding to at least one respective symmetry point ~~which is not the correlation function extremum,~~ based on a plurality of the image-dependent correlation function value points bounding the correlation function extremum, the at least one respective spatial translation position ~~corresponding to the at least one symmetry point~~ indicative of the displacement of the second image relative to the first image,

wherein the means for estimating the spatial translation position corresponding to the at least one respective symmetry point comprises means for determining the midpoint of at least one line segment having a first endpoint that is one of

a) an image-dependent correlation function value point, and

b) an estimated correlation function value point lying on the correlation function on a first side of the correlation function extremum, and a second endpoint that is one of

a) an image-dependent function value point, and

b) an estimated correlation function value point lying on the correlation function on the second side of the correlation function extremum.

47. (Previously Presented) The image-correlation optical position determining device according to claim 46, further comprising means for acquiring the first image and the second image.

48. (Previously Presented) The image-correlation optical position determining device according to claim 46, wherein the first and second images acquired by the sensing device comprise speckle images.

49. (Previously Presented) The image-correlation optical position determining device according to claim 48, further comprising means for acquiring the first image and the second image.

50. (Currently Amended) An image-correlation optical position determining device, comprising:

a sensing device that receives light and that forms at least a first image based on respective received light and a second image based on respective received light; and

signal generating and processing circuitry that determines, based on the first and second images formed by the sensing device, a set of image-dependent correlation function value points indicative of a correlation function extremum and that estimates at least one respective spatial translation position corresponding to at least one respective symmetry point based on a plurality of the image-dependent correlation function value points bounding the correlation function extremum, the at least one respective spatial translation position ~~representing~~ indicative of the displacement of the second image relative to the first image;

wherein estimating the spatial translation position ~~does not depend on characterizing~~ corresponding to the at least one respective symmetry point comprises:

determining a first line including two image-dependent correlation function ~~in~~ value points lying on the ~~vicinity~~ correlation function on a first side of the correlation function extremum,

determining a second line having a slope that is the negative of the slope of the first line and that includes an image-dependent correlation function value point lying on the correlation function on a second side of the correlation function extremum and having a correlation function value in a range included within a range whose end points are the correlation function values of the two image-dependent correlation function value points included in the first line, and

determining the spatial translation position corresponding to the intersection of the first and second lines.

51. (Currently Amended) A speckle-image-correlation optical position determining device, comprising:

a sensing device that receives light scattered from a portion of an optically diffusing surface that is movable relative to the sensing device and that is illuminated with coherent light, the sensing device forming at least a first image based on respective received light and a second image based on respective received light; and

signal generating and processing circuitry that estimates, based on the first and second images, a first plurality of correlation function value points indicative of a correlation function extremum and that estimates, based on a set of image-dependent correlation function values comprising at least some of the plurality of image-dependent correlation function value points, at least one respective spatial translation position ~~representing~~ indicative of the displacement of the second image relative to the first image;

wherein estimating the spatial translation position ~~does not depend on characterizing~~ corresponding to the at least one respective symmetry point comprises:

determining a first line including two image-dependent correlation function ~~in~~ value points lying on the ~~vicinity~~ correlation function on a first side of the correlation function extremum,

determining a second line having a slope that is the negative of the slope of the first line and that includes an image-dependent correlation function value point lying on the correlation function on a second side of the correlation function extremum and having a correlation function value in a range included within a range whose end points are the correlation function values of the two image-dependent correlation function value points included in the first line, and

determining the spatial translation position corresponding to the intersection of the first and second lines.

52. (Currently Amended) An information storage medium that stores a program, executable on a processing device, for estimating a displacement of a second image acquired by a sensing device relative to a first image acquired by the sensing device, the program comprising:

instructions for determining a set of image-dependent correlation function value points indicative of a correlation function extremum, each image-dependent correlation function value point based at least partially on a pattern of image values included in both the first image and the second image, each image-dependent correlation function value point further based on a respective known spatial translation of the image values in the second image relative to the image values in the first image; and

instructions for estimating at least one respective spatial translation position corresponding to at least one respective symmetry point ~~which is not the correlation function extremum,~~ based on a plurality of image-dependent correlation function value points bounding the correlation function extremum, the at least one respective spatial translation

position ~~corresponding to the at least one symmetry point~~ indicative of the displacement of the second image relative to the first image,

wherein instructions for estimating the spatial translation position corresponding to the at least one respective symmetry point comprises determining the midpoint of at least one line segment having a first endpoint that is one of

a) an image-dependent correlation function value point, and

b) an estimated correlation function value point lying on the correlation function on a first side of the correlation function extremum, and a second endpoint that is one of

a) an image-dependent function value point, and

b) an estimated correlation function value point lying on the correlation function on the second side of the correlation function extremum.

53. (Previously Presented) The information storage medium of claim 52, wherein the instructions for estimating comprise instructions for excluding from the plurality of correlation function value points bounding the correlation function extremum at least one correlation function value point which lies at a spatial offset bounded by other members of the plurality of correlation function value points.

54. (Currently Amended) An information storage medium that stores a program, executable on a processing device, for estimating a displacement of a second image acquired by a sensing device relative to a first image acquired by the sensing device, the program comprising:

instructions for determining a set of image-dependent correlation function value points indicative of a correlation function extremum, each image-dependent correlation function value point based at least partially on a pattern of image values included in both the first image and the second image, each image-dependent correlation function value point further based on a respective known spatial translation of the image values in the second image relative to the image values in the first image; and

instructions for estimating a spatial translation position based on a plurality of correlation function value points bounding the correlation function extremum, the spatial translation position representing the displacement of the second image relative to the first image;

wherein estimating the spatial translation position ~~does not depend on characterizing~~ corresponding to the at least one respective symmetry point comprises:

determining a first line including two-image-dependent correlation function ~~in~~ value points lying on the ~~vicinity~~ correlation function on a first side of the correlation function extremum,

determining a second line having a slope that is the negative of the slope of the first line and that includes an image-dependent correlation function value point lying on the correlation function on a second side of the correlation function extremum and having a correlation function value in a range included within a range whose end points are the correlation function values of the two image-dependent correlation function value points included in the first line, and

determining the spatial translation position corresponding to the intersection of the first and second lines.

55. (Currently Amended) The information storage medium of claim 54, wherein the instructions for estimating the at least one respective spatial translation position comprises instructions for estimating the correlation function curve over at least one range comprising spatial translation position values outside the vicinity of the correlation function extremum, and instructions for estimating the spatial translation position based on at least one characteristic of the estimated correlation function curve which is not local to the vicinity of the correlation function extremum.

56. (Previously Presented) The information storage medium of claim 55, wherein the at least one characteristic of the estimated correlation function curve which is not local to the vicinity of the correlation function extremum comprises the location of a presumed line of symmetry.

57. The information storage medium of claim 54, wherein the displacement of the second image relative to the first image is indicative of movement of a surface which moves relative to the sensing device.

58. (Previously Presented) The information storage medium of claim 54, wherein the first and second images comprise a speckle pattern.